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8th INTERNATIONAL SIBERIAN EARLY CAREER GEOSCIENTISTS CONFERENCE

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TRANSFORMATION OF INDUCTION-GALVANIC LOGGING SIGNALS USING SPLINE INTERPOLATION AND INTERPRETATION CHARTS

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The research aims at the development of algorithms for processing the logging tool signals generated by a circular magnetic current [1] mounted on a metallic stem, to characterize the electrophysical characteristics of a geologic section. The processing includes two approaches to signal transformation: based on spline interpolation [2] and interpretation charts [3]. As far as any starting model relies on transformants, a properly chosen strategy for transformation determines the efficiency of the further data inversion [4]. The developed and software-implemented algorithms for the transformation of the measured signals to the values of the apparent resistivity and electrical macroanisotropy coefficient are as follows:

1. Transformation into the values of the apparent resistivity within the scope of a homogeneous medium model. Transformation to the apparent resistivity, taking into consideration the borehole parameters. The algorithm relies on 3D spline interpolation of the measured signals depending on the formation resistivity, as well as on the borehole radius and mud resistivity.

2. Transformation to the values of the apparent resistivity and electrical macroanisotropy coefficient within a homogeneous transversely isotropic medium. The algorithm is based on 2D spline interpolation of the measurement signals that are the function of the horizontal formation resistivity and electrical macroanisotropy coefficient.

It should be noted that the spline interpolation algorithms are characterized by a high precision (the interpolation error at the grid points does not exceed the order of magnitude of 10^{-4} %). We have carried out a comparative analysis of the spline interpolation results and those acquired via the conventional utilization of interpretation charts. The algorithms have been tested and verified for the cases of different sonde spacings and operation frequencies over a wide range of 2D geoelectric models typical of Western Siberia petroleum reservoirs, as a result of which we may conclude about their effectiveness.

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